Report #094

Red River Coal Company
Benthic Macroinvertebrate Survey
Fall 2012

EXECUTIVE SUMMARY

Biological Monitoring, Inc. (BMI) performed a stream survey in the South Fork Pound River Watershed for Red River Coal Company. The purpose of this survey was to conduct instream assessments as outlined in Red River's permits. Six instream monitoring stations were sampled.

The Virginia Stream Condition Index (VASCI) protocol was used for instream biological surveys. All biological sampling was performed in accordance with the Virginia Department of Game and Inland Fisheries' scientific collection permit requirements.

Samples were collected on November 5th, 2012. Benthic samples were collected based on BMI's QAPP. All organisms were identified to the lowest practicable level and collapsed to the family level for VASCI calculation. The US EPA's Rapid Bioassessment Protocols for use in Wadeable Streams and Rivers was used for sampling macroinvertebrate populations and performing habitat assessments.

The analysis of the Fall 2012 survey data yielded VASCI scores ranging from 20.61 (SFP-1) to 66.57 (SC-1). Using the Virginia Department of Environmental Quality devised scale, these stations were classified in the "Severe Stress", "Stress" and "Good" Aquatic Life Use (ALU) Tiers. The habitat assessment scores ranged from 151 (SC-1) to 167 (SFP-1A) falling into the "Suboptimal" and "Optimal" categories of habitat. Physicochemical and chemical analyses seem typical for mining influenced streams in the region.

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1.0 INTRODUCTION

Biological Monitoring, Inc. (BMI) performed a stream survey for Red River Coal Company in the South Fork Pound River Watershed located in Wise County, Virginia. The purpose of this survey was to conduct instream assessments in fulfillment of permit requirements. The present report provides the methods utilized and the results obtained from the November 5, 2012 sampling event.

BMI is a Tier III (VA) bio-monitoring facility as well as a National Environmental Laboratory Accreditation Program (NELAP) accredited Whole Effluent Toxicity Laboratory. BMI specializes in issues of water quality. Since 1980, BMI has been providing expertise in aquatic toxicology and risk assessment. Highly motivated and academically trained scientists at BMI work closely with clients to create practical solutions to environmental problems. BMI has maintained a commitment to the research and development of aquatic biomonitoring and toxicological concepts resulting in leading edge technologies and applications.

BMI interacts with regulatory agencies on behalf of its clients to solve specific environmental problems associated with water quality and toxicological regulations and permit compliance. With its main facilities located in Blacksburg, Virginia, BMI focuses on the development and application of procedures to create feasible solutions that balance the need for environmental protection and continued economic development.

2.0 METHODS AND MATERIALS

2.1 General

On November 5, 2012, samples were collected from several instream stations in the South Fork Pound River Watershed. Generally, instream stations were sampled for benthic macroinvertebrates as well as analytical and physicochemistry.

Grab samples were used for analytical and physicochemistry. Macroinvertebrate samples were collected following BMI's Biological Monitoring Program Quality Assurance Project Plan for Wadeable Streams and Rivers (QAPP) (BMI 2012). The Virginia Stream Condition Index (VASCI) protocol was used for this instream biological survey (Tetra Tech 2003). The US EPA's Rapid Bioassessment Protocols for use in Wadeable Streams and Rivers (RBP) was used for sampling macroinvertebrate populations and performing habitat assessments (USEPA 1999).

Qualitative habitat assessments were conducted at each bioassessment site by trained and experienced individuals. Physicochemical monitoring was performed in the field. Chemistry samples were collected and submitted to Environmental Monitoring, Inc. for analyses. This survey was conducted in accordance with Red River's permit conditions.

2.2 Station Location

Six instream monitoring stations were specified for this project. Station location was provided by the permittee. These stations were located in Wise County, Virginia and in the South Fork Pound River Watershed. Latitude and longitude coordinates were recorded at the downstream extent of the station using a Garmin® Global Positioning System portable unit (GPSMAP 60 CSX). Table 1 summarizes the monitoring station

attributes. Figure 1 provides a map of the area and the location of the monitoring stations. Figure 2 presents an orthophoto of study area. Station photographs are presented as Appendix A.

Table 1. Monitoring Station Attributes.

Station ID	Location Summary	Latitude	Longitude
SFP-1	Most upstream station	37° 03' 57.0"	82° 41' 40.6"
SFP-1A	Approximately 50m US Road Crossing	37° 04' 15.3"	82° 41' 02.8"
SFP-2	Downstream of confluence of Rat Creek and South Fork Pound River	37° 04' 45.9"	82° 39' 30.8"
SC-1	Mouth of Short Creek	37° 04 36.9"	82° 39' 29.4"
RC-1	Mouth of Rat Creek	37° 04' 36.3"	82° 39' 27.1"
GF-1	Mouth of Glady Fork	37° 05' 23.1"	82° 37' 51.4"
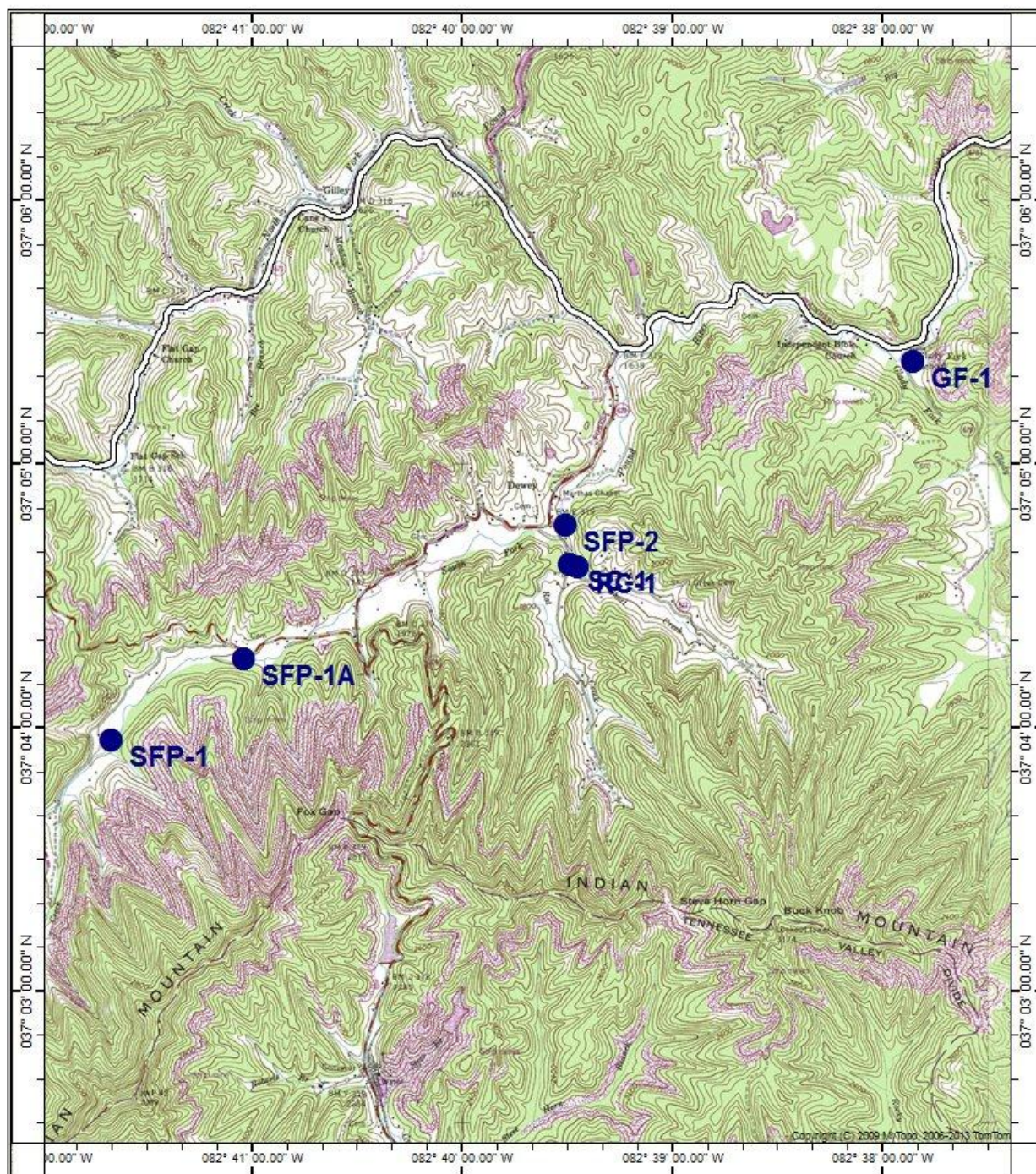
Figure 1. Map of the Monitoring Stations.
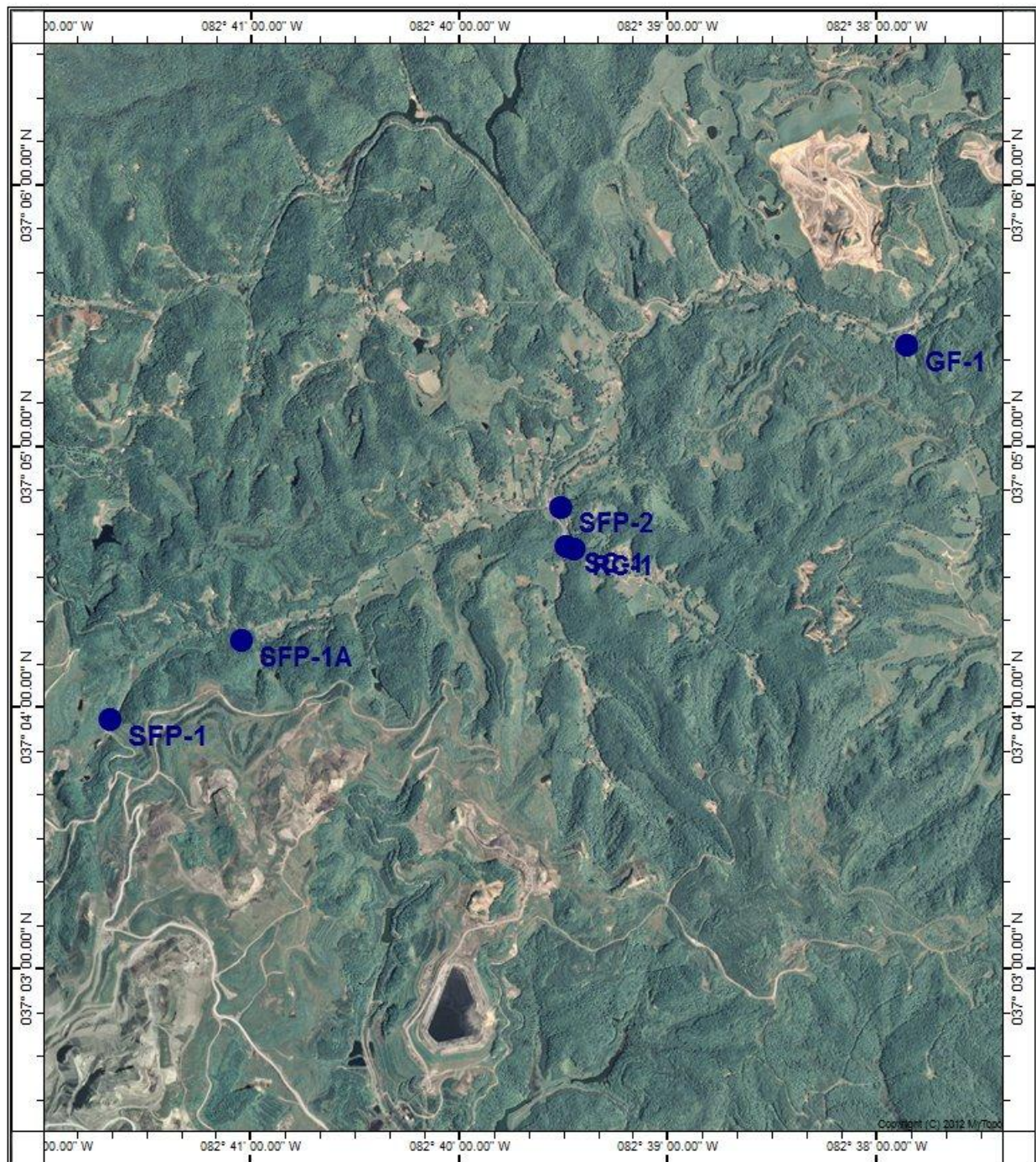
Figure 2. Orthophoto of the Study Area

2.3 Macroinvertebrate Sampling & Assessment

2.3.1 Sampling & Identification

All biological sampling was performed in accordance with the Virginia Department of Game and Inland Fisheries' scientific collection permit requirements. Macroinvertebrates were collected at each benthic station following the single habitat approach (riffle-run) as presented in the QAPP (BMI 2012). Samples were collected using a semi-quantitative approach.

Four samples were collected at each station using a 0.50 m wide rectangular kick-net having a 500 μm mesh size. Each sample was collected by first placing the net on the bottom downstream of the 0.50 m^2 area to be sampled. Where appropriate, large rocks and debris were brushed off into the net and removed. The area to be sampled was then vigorously kicked for approximately 30 to 90 seconds or the Best Professional Judgment of the scientist. For each monitoring station, the four samples were rinsed, composited, placed in a labeled container, and preserved in 70% ethanol. Sample information was recorded on a BMI Sample Chain of Custody Form and returned to BMI's laboratory for enumeration and identification.

Organisms were separated from the debris in the laboratory. Subsampling was performed on each sample to a standard count of 110 ± 10%. All organisms were identified to the lowest practicable level. Organism identification utilized the appropriate taxonomic keys (Merritt and Cummins 2008). All data analysis was performed at the family level in order to use the Virginia Stream Condition Index (VASCI). All organisms from this study will be retained for a period of at least five years.

2.3.2 Macroinvertebrate Data Assessment

Macroinvertebrate data were analyzed using *A Stream Condition Index for Virginia Non-Coastal Streams* (Tetra Tech 2003). This VASCI was developed from an analysis of data collected by the Virginia DEQ from 1994 to 1998 and 1999 to 2002. Using these data, VASCI designated statewide reference values were determined for each of the following eight metrics of community structure:

- **Total Number of Taxa** measures the total number of distinct taxa and, therefore, is representative of the diversity within a sample. High diversity is a strong indicator of stream health and ability to sustain populations. This metric value is expected to decrease in response to increased perturbation.

- **Total Number of EPT Taxa** is a measure of the total number of distinct taxa within the Orders Ephemeroptera, Plecoptera, and Trichoptera. These orders include the mayflies, stoneflies, and caddis flies, respectively. Organisms in these three orders have low tolerances to perturbation. As a result, the value of the metric is expected to decrease in response to increasing perturbation.

- **Percent Ephemeroptera** is the percentage of individual Ephemeroptera (mayflies) within a sample. This metric is calculated by dividing the number of Ephemeroptera by the total number of sample organisms. This metric indicates the relative abundance of this sensitive order within the stream community. The value of this metric is expected to decrease in response to increasing perturbation.

- **Percent P T Less Hydropsychidae** is the percentage of individuals from the orders Plecoptera and Trichoptera "less" the individuals from the family Hydropsychidae. This metric is calculated by dividing the number

of organisms from the orders Plecoptera and Trichoptera (less Hydropsychidae) by the total number of sample organisms. This metric indicates the relative abundance of these sensitive orders within the stream community. The value of this metric is expected to decrease in response to increasing perturbation.

- **Percent Scrapers** is percent abundance of individuals in the sample whose primary functional mechanism for obtaining food is to graze on substrate or periphyton, attached algae and associated material within a sample. This metric is calculated by dividing the number of organisms from the functional feeding group "scrapers" by the total number of sample organisms. The value of this metric is expected to decrease in response to increasing perturbation.

- **Percent Chironomidae** is the percent individual organisms of the Family Chironomidae within a sample. The metric is calculated by dividing the number of Chironomidae organisms by the total number of sample organisms. Family Chironomidae, the midges, are tolerant to perturbation and their relative abundance tends to increase in impacted streams. As a result, the value of this metric is expected to increase in response to increasing perturbation.

- **Percent Two Dominant Taxa** is the percentage of total individuals in the two taxa with the greatest number of organisms. The metric is calculated by adding the number of organisms present in the two largest taxa. Dividing this sum by the total number of organisms yields the relative abundance of the two dominant taxa. Samples with populations concentrated into a few taxa may be an indication of impact. This metric is expected to increase in response to increasing perturbation.

- **Hilsenhoff Biotic Index** (HBI) was originally designed to evaluate organic pollution by utilizing tolerance values to weight taxa abundance. The

resulting HBI value is an estimation of overall pollution level. The metric
is expected to increase in response to increasing perturbation.

The VASCI metrics and their expected response to perturbation are summarized in Table
2.

Table 2. VASCI Metrics and Expected Responses.

Metric	Expected Response
Total Number of Taxa	Decrease
Total Number of EPT Taxa	Decrease
Percent Ephemeroptera	Decrease
Percent PT Less Hydropsychidae	Decrease
Percent Scrapers	Decrease
Percent Chironomidae	Increase
Percent Two Dominant Taxa	Increase
Hilsenhoff Biotic Index	Increase

VASCI scores for each of the monitoring stations were calculated by dividing each
station's metric values by the corresponding VASCI statewide reference values. This
yielded a percentage score for each metric relative to the statewide reference condition.
If the percentage score of any individual metric was greater than 100, the score was
truncated to 100. The eight resulting values were then averaged to arrive at the VASCI
score for each station.

2.4 Habitat Assessment

Habitat assessments were performed at each benthic station where macroinvertebrates
were collected. These assessments were performed as per the RBP (USEPA 1999). Ten

habitat parameters were assessed, each receiving a score of 0 – 20. A description of each of the habitat parameters follows:

- **Epifaunal Substrate / Available Cover** rate the availability of structures in the stream that can be utilized as refuge, spawning, and feeding sites by macroinvertebrates. Examples of such structures would include boulders, cobble, undercut banks, roots, logs and branches. The availability of cover can be a limiting factor on stream diversity and abundance.

- **Embeddedness** rate the degree to which coarse substrate such as gravel; cobble and boulders are sunken into the sand, silt and mud substrate of the stream bottom. Embeddedness is the result of sediment movement and deposition. Increased embeddedness reduces the available refuge, feeding and spawning sites available to macroinvertebrates resulting in lower diversity and abundance.

- **Velocity / Depth Regimes** gauge the presence or absence of four velocity-depth patterns. These patterns are slow-deep, slow-shallow, fast-deep, and fast-shallow. Ideally, all four patterns should be present to best provide a stable diverse stream community.

- **Sediment Deposition** rates the degree to which new sediment has accumulated in pools, point bars and islands. Sediment deposition may be an indicator of an unstable environment and lowered diversity.

- **Channel Flow Status** rates the degree to which water fills the stream channel. Channel flow status may be affected by obstructions, diversions or widening of the stream channel. As less of the channel is filled by water, the amount of suitable substrate is also reduced.

- **Channel Alteration** rate the degree to which the shape of the stream channel has been altered.   Alterations may include bridges, roads, diversion channels, channel straightening, artificial embankments, riprap,

dams, weirs, and other instream structures. Channel alteration often results in scouring and loss of available habitat.

- **Frequency of Riffles (or Bends)** rates the presence of quality riffle or sinuous habitat. Riffles and sinuous streams provide quality habitat for stable, diverse communities.

- **Bank Stability** indicates the degree to which banks have eroded or may erode. Eroded banks are a sign of sediment movement and deposition, which leads to reduced epifaunal habitat. Unstable banks may also point to poor vegetative cover.

- **Bank Vegetative Protection** gauges the extent of vegetative protection at the stream bank and the nearby riparian zone. Bank vegetation plays a vital role in erosion control, nutrient uptake, stream shading, and food supply.

- **Riparian Vegetative Zone Width** measures the extent of natural vegetation from the stream through the riparian zone. Wide vegetative zones provide pollution buffering, erosion control, habitat, nutrient uptake and nutrient input. These beneficial contributions can be impaired by commercial and residential development, roads, pastures, actively worked fields, etc.

Table 3 identifies each of the ten Habitat Assessment Parameters and their range of scores. Scores for each parameter were recorded on Habitat Assessment Field Log Sheets (USEPA 1999). The habitat assessment score for each station was calculated by adding the score for each parameter yielding a station total. The highest attainable score was 200. The actual habitat assessment process involves rating the ten parameters as optimal (>153), suboptimal (101-153), marginal (46-100), or poor (<45).

Table 3. Habitat Assessment Parameters

Parameter	Description	Scoring
1	Epifaunal Substrate / Available Cover	0-20
2	Embeddedness	0-20
3	Velocity / Depth Regime	0-20
4	Sediment Deposition	0-20
5	Channel Flow Status	0-20
6	Channel Alteration	0-20
7	Frequency of Riffles or Bends	0-20
8	Bank Stability	Left 0-10
		Right 0-10
9	Vegetative Protection	Left 0-10
		Right 0-10
10	Riparian Vegetative Zone Width	Left 0-10
		Right 0-10

2.5 Physicochemical Assessment

Prior to any field data collections, all handheld meters were calibrated. Conductivity (µS), Dissolved Oxygen (mg/L), pH (SU) and temperature (°C) were recorded at each of the sample stations, where appropriate. Conductivity, Dissolved Oxygen, pH and Temperature were all recorded using calibrated field meters. Field meters included an Oakton PCTestr 35 combination pH/EC/TDS/Temperature Meter and a Hanna model HI 9142 Dissolved Oxygen Meter.

2.6 Chemical Monitoring

Samples for analytical chemistry were collected and analyzed by Environmental Monitoring, Inc.

3.0 RESULTS

3.1 Station Location

Station attributes, including latitudes and longitudes are presented in Table 1 and depicted in Figures 1 and 2. Station photographs are presented in Appendix A. Flow was adequate for sampling at all stations.

3.2 Macroinvertebrate Monitoring Data

3.2.1 Virginia Stream Condition Index Metrics

The 110 ± 10% subsample is summarized in Table 4. The VASCI metric values for the monitoring stations sampled are summarized in Table 5. Raw data are presented in Appendix B.

Table 4. Identification / Enumeration Data

Order	Family	SFP-1	SFP-1A	SFP-2	SC-1	RC-1	GF-1
Coleoptera	*Elmidae*				3		1
	Psepheniidae	1			1		
Diptera	*Tipulidae*	1		1	8	2	1
	Chironomidae	68	77	43	20	54	15
	Empididae					1	
	Simuliidae	32	1		6	1	3
Ephemeroptera	*Baetidae*				7	2	
	Ephemerellidae				2		
	Heptageniidae				3		
Plecoptera	*Capniidae*		9	23	8		31
	Leuctridae		11		26	3	
	Nemouridae				2	2	5
	Taeneopterigidae			9			33
Trichoptera	*Hydropsychidae*	3	19	27	9	33	12
	Philopotamidae				6	3	1
	Rhyacophilidae			1			6
Odonata	*Calopterygidae*	1					
	Gomphidae					1	
Megaloptera	*Corydalidae*	2					1
Oligochaeta		7					1
Collembola					7		
Isopoda	*Asellidae*				1		
	Total	**115**	**117**	**104**	**109**	**102**	**111**

Table 5. VASCI Metrics.

	SFP-1	SFP-1A	SFP-2	SC-1	RC-1	GF-1
Total Taxa	8	5	6	15	11	12
EPT Taxa	1	3	4	8	6	6
%Ephemeroptera	0	0	0	11.01	1.96	0
%Plec+Tric less Hydropsych.	0	17.09	31.73	38.53	27.45	68.47
%Scrapers	0.87	0	0	6.42	0	0.9
%Chironomidae	59.13	65.81	41.35	18.35	52.94	13.51
% Top 2 Dominant	86.96	82.05	63.46	42.2	72.55	57.66
HBI (Family)	6.05	5.05	4.46	3.47	4.53	2.85

3.2.2   Virginia Stream Condition Index Scores

Table 6 presents a summary of the VASCI scoring. Raw data are presented in Appendix B. Each metric score represents a percentage of the statewide reference condition. The VASCI scores calculated ranged from 20.61 (SFP-1) to 66.57 (SC-1).

Table 6. VASCI Scoring.

	SFP-1	SFP-1A	SFP-2	SC-1	RC-1	GF-1
Total Taxa	36.36	22.73	27.27	68.18	50	54.55
EPT Taxa	9.09	27.27	36.36	72.73	54.55	54.55
%Ephemeroptera	0	0	0	17.96	3.20	0
%Plec+Tric less Hydropsych.	0	48.02	89.13	100	77.11	100
%Scrapers	1.69	0	0	12.45	0	1.75
%Chironomidae	40.87	34.19	58.65	81.65	47.06	86.49
% Top 2 Dominant	18.85	25.94	52.80	83.52	39.67	61.19
HBI (Family)	58.06	72.78	81.45	96.06	80.45	100
VASCI	**20.61**	**28.86**	**43.21**	**66.57**	**44.00**	**57.31**

Figure 3 is a graphical representation of the VASCI score(s) along with the Aquatic Life Use Tiers. It should be noted that four tiers exist in the VASCI, whereas, a score of 60 or higher is considered "unimpaired" and a score of < 60 is considered "impaired".
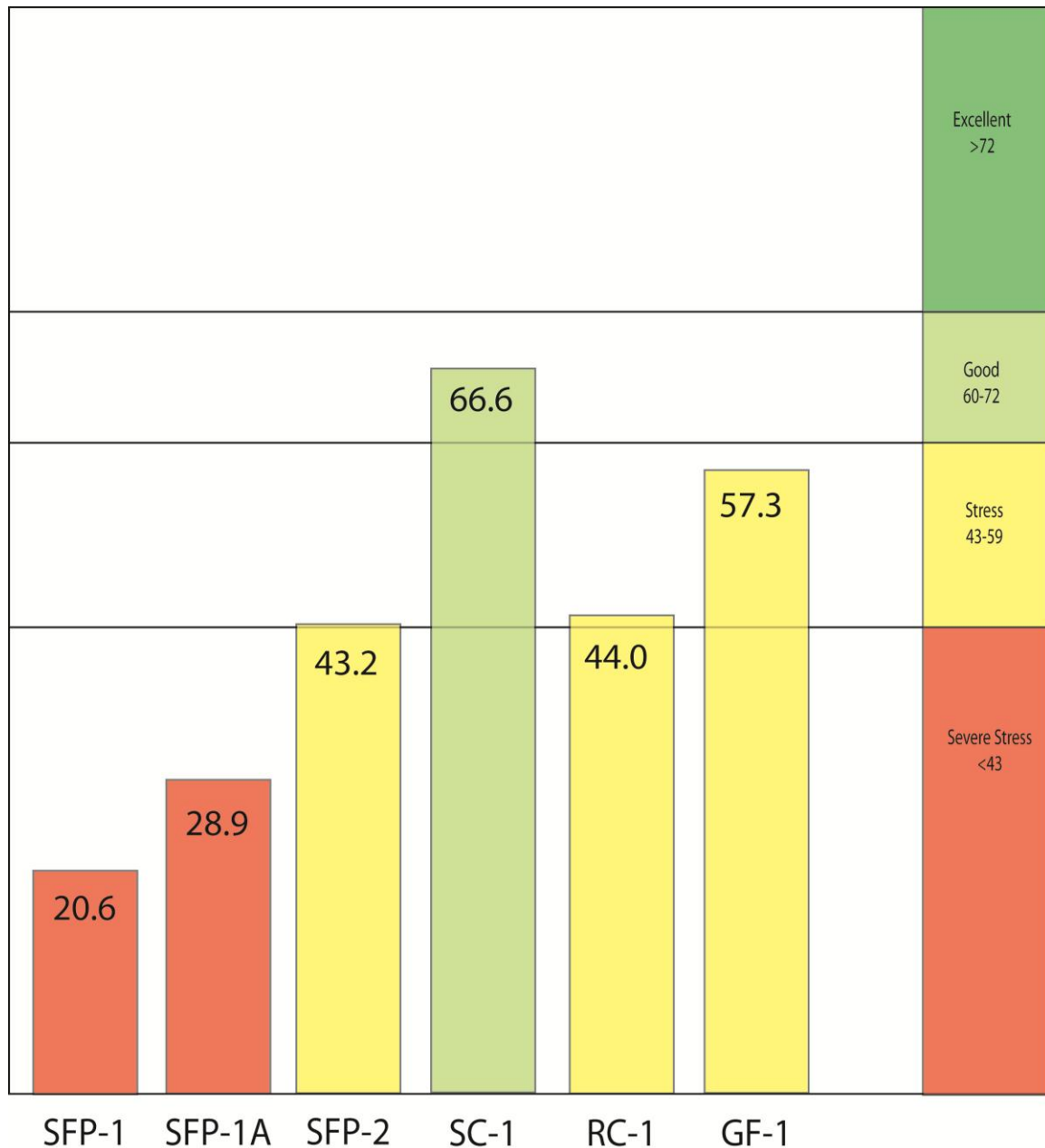

Figure 3. VASCI Scoring Summary

3.3   Habitat Assessment

Table 7 presents a summary of the habitat assessment score for the monitoring stations. Raw data are presented in Appendix B. The habitat assessment scores ranged from 151 (SC-1) to 167 (SFP-1A) falling into the "Suboptimal" and "Optimal" categories of habitat.

Table 7. RBP Habitat Scoring.

Parameter	SFP-1	SFP-1A	SFP-2	SC-1	RC-1	GF-1
Subst./Cover	17	17	17	16	18	16
Embeddedness	15	13	15	13	14	15
Velocity	17	18	19	17	19	19
Sediment Dep.	13	15	16	14	14	15
Channel Flow	20	20	20	19	20	20
Channel Alt.	15	16	15	15	14	14
Freq of Riffles	18	19	20	20	20	19
Bank Stab L	6	5	8	9	9	10
Bank Stab R	9	8	9	9	7	8
Veg. Prot. L	6	10	8	6	10	10
Veg. Prot. R	10	10	5	8	8	5
Rip. Zone L	2	8	3	0	6	10
Rip. Zone R	10	8	0	5	2	2
Total	**158**	**167**	**155**	**151**	**161**	**163**

Figure 4 is a visual representation of the habitat score(s) obtained for this permit along with the different tiers.
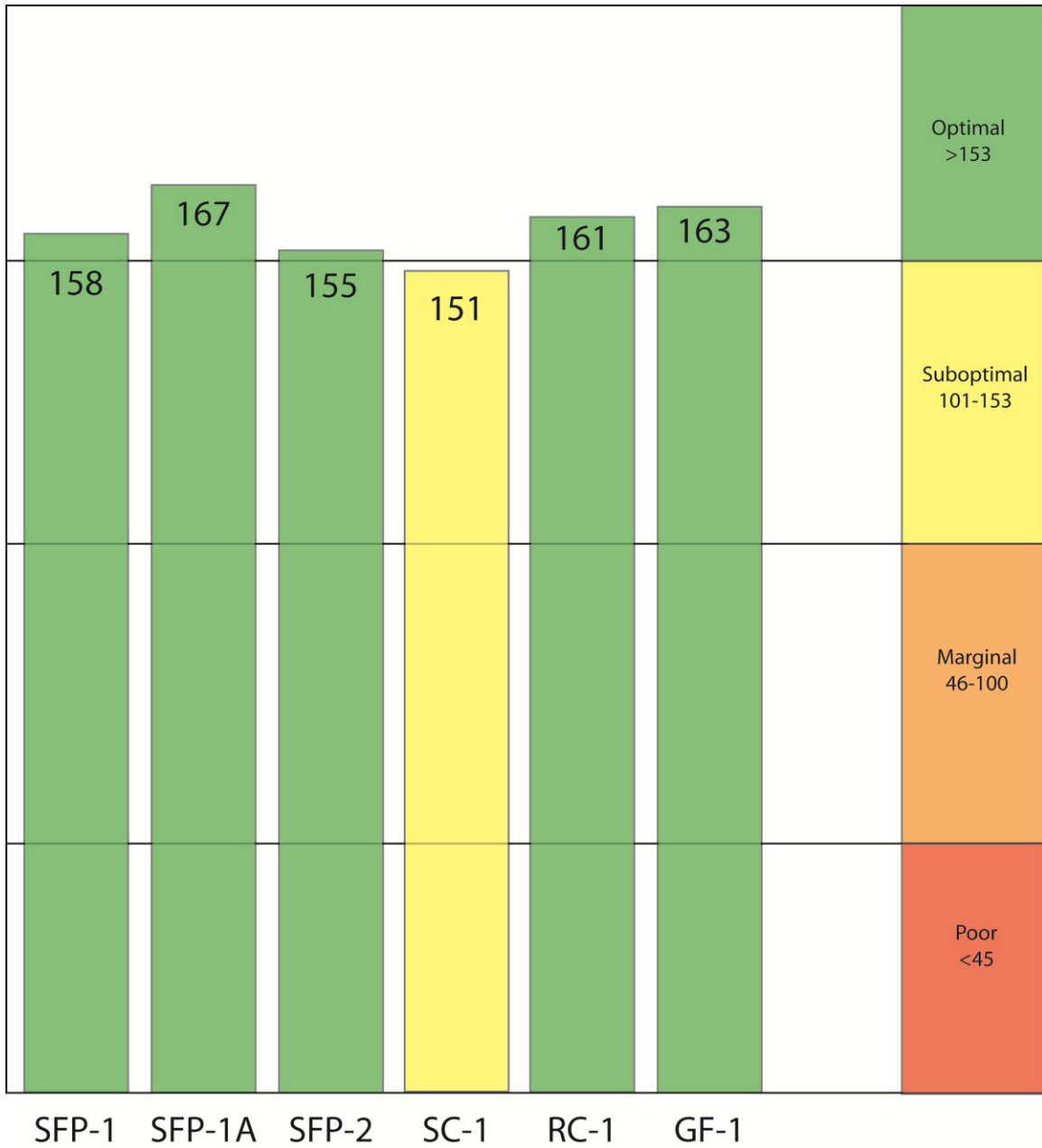
Figure 4. Habitat Scoring Sumary

3.4 Water Quality Assessment

Table 8 presents the water quality assessments.

Table 8. Water Quality Analyses.

	SFP-1	SFP-1A	SFP-2	SC-1	RC-1	GF-1
Conductivity (µS/cm)	2020	2060	1942	401	1224	512
Dissolved Oxygen (mg/L)	8.3	9.0	9.0	9.2	9.2	9.3
pH (SU)	7.6	8.2	8.4	8.1	8.0	7.9
Temperature (°C)	14.0	12.4	12.4	9.2	9.4	7.7

3.5 Chemical Monitoring

Results from the chemical monitoring are not included in this report. Results will be provided by Environmental Monitoring, Inc. separately.

4.0 DISCUSSION

Water quality and both instream and riparian habitat are important determinants of the composition, structure, and function of biotic communities. The instream water quality assessments and the RBP Habitat Assessment techniques used in this study do not provide adequate discriminatory power to differentiate cause and effect. A systematic assessment of instream and riparian habitat quality is necessary to fully assess water quality conditions in streams and rivers (USEPA 1999).

4.1 Station Location

Since the sampling locations were presumably specified in the permit, it is assumed that they are representative of the permit in question. Furthermore, this study represents a significant component of the holistic watershed management approach cited in DMLR Guidance Memorandum 32-10 Revised (DMLR 2011).

4.2 Macroinvertebrate Data

The VASCI values in this study should be considered a relative ranking, indicating the comparability of the studied stream to the statewide reference for least disturbed streams. As such, these values should not be considered an absolute rating.

The VASCI validation document recommends Aquatic Life Use tiers based on the VASCI scores (VADEQ 2006). These tiers and their respective scores are as follows:

- ➢ "Severe Stress indicates scores below 43;
- ➢ "Stress" indicates scores from 43 to 59;
- ➢ "Good" conditions indicate scores from 60 to 72; and
- ➢ "Excellent" stream quality is represented by scores above 72.

The VASCI scores calculated for this permit ranged from 20.61 (SFP-1) to 66.57 (SC-1). These scores fall into the "Severe Stress", "Stress" and "Good" Aquatic Life Use tiers.

4.3 Habitat Assessment

Habitat plays an important role in species composition, various assemblages and numbers of organisms found in aquatic environments. To make meaningful impact analyses, one must consider habitat data as a possible limiting factor. The habitat assessment scores ranged from 151 (SC-1) to 167 (SFP-1A) falling into the "Suboptimal" and "Optimal" categories of habitat.

RBP habitat assessment techniques are qualitative in nature and designed to determine comparability and ranking amongst stations. Traditionally, this approach assumes the presence of a reference station for the data set. To further explore the role habitat may be playing on the benthic score; additional data will have to be collected.

4.4 Water Quality Assessment

The water chemistry parameters examined, conductivity, pH, temperature and flow, were typical for streams influenced by urban environments and mining in the region.

5.0 LITERATURE CITED

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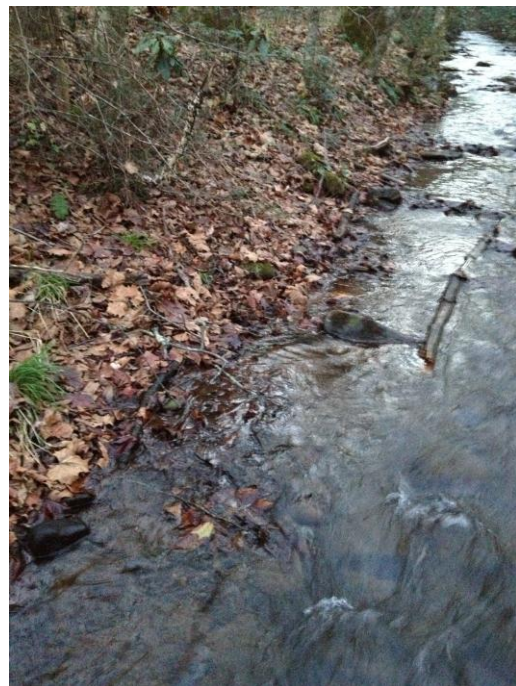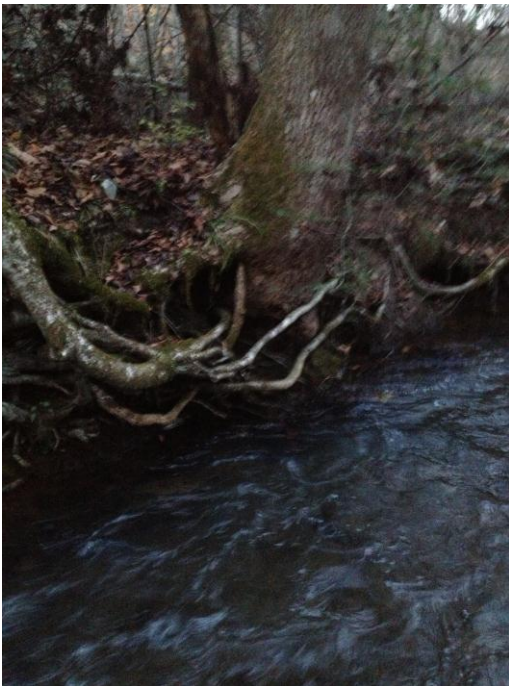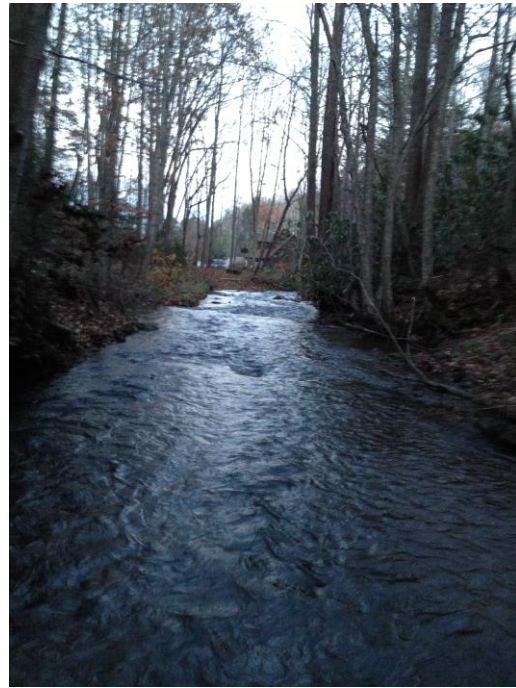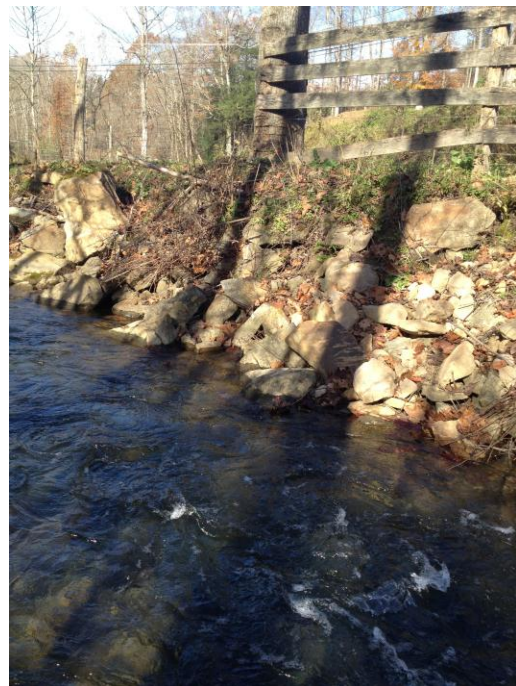
APPENDIX A:

STATION PHOTOGRAPHS

SFP-1
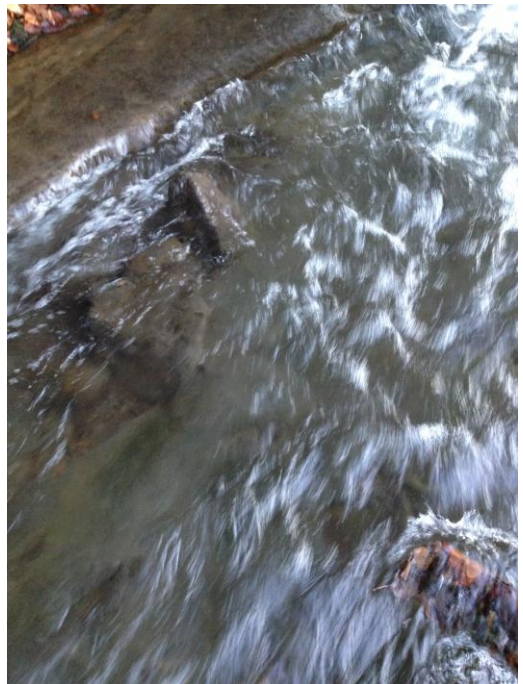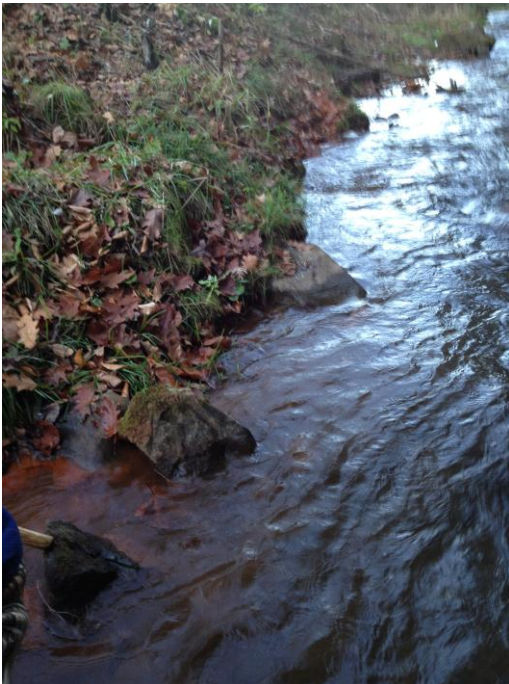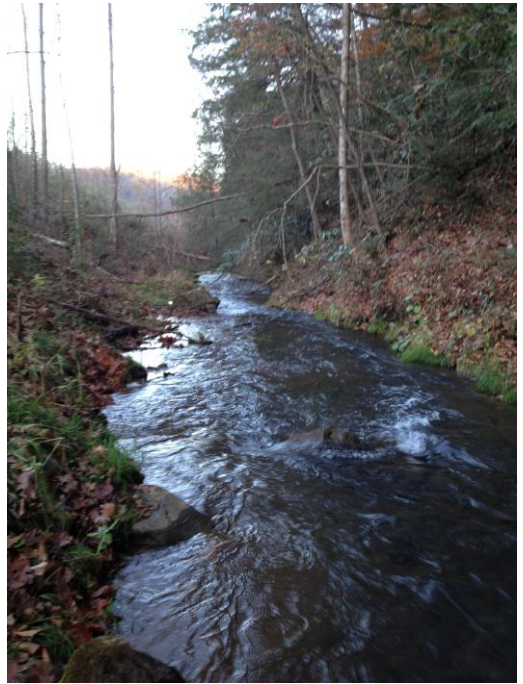
SFP-1A

SFP-2

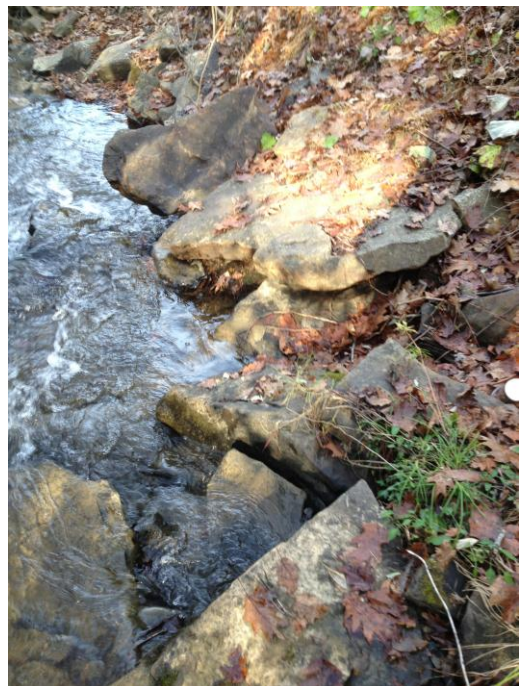**SC-1**

RC-1

GF-1

APPENDIX B:

RAW DATA

Station
SFP1

Total Hydropsychidae	Total Ephemeroptera	Total Scrapers	Total Chironomidae	Total PT	Abundance	Total Taxa	EPT Taxa
3.00	0.00	1.00	68.00	3.00	115.00	8.00	1.00

% Ephemeroptera	% PT less Hydropsychidae	% Scrapers	% Chironomidae	Two Dominant Taxa #	% Top two dominant taxa	FFG #	HBI (Family)
0.00	0.00	0.87	59.13	100.00	86.96	696.00	6.05

SFP1

	VASCI Metrics vs. Standard	VASCI Metrics (Truncated)
Number of Taxa	36.36	36.36
Number of EPT Taxa	9.09	9.09
Percent E	0.00	0.00
Percent PT Less Hydropsychidae	0.00	0.00
Percent Scrapers	1.69	1.69
Percent Chironomidae	40.87	40.87
Percent Two Dominant	40.87	18.85
Hilsenhoff Biotic Index	58.06	58.06

Raw VASCI	Final VASCI
20.61	20.61

Benthic Macroinvertebrate Laboratory Bench Sheet

Station ID:	SFP1	Sample Subsorted by:		Date Subsorted:	
StationName:		# of Grids subsorted:			
Date Sampled:	/ /	Total # of Subsorted Insects:			
Sampling Method:		Sample Identified by:		Date Identified:	

BMC	TAXON	# of larvae	Total # of Organisms	# to Ref.Coll.
1	Oligochaeta	⊮Ⅱ	7	
2	Tipulidae	Ⅰ	1	
3	Simuliidae	⊮⊮⊮⊮⊮Ⅱ	32	
4	Chironomidae	⊮⊮⊮Ⅲ ⊮⊮⊮⊮⊮⊮⊮⊮⊮	68	
5	Psephenidae	Ⅰ	1	
6	Corydalidae	Ⅱ	2	
7	Calopterygidae	Ⅰ	1	
8	Hydropsychidae Ceratopsyche	Ⅲ	3	
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24				
25				
	TOTALS		115	

Sub-sample and Sample Reduction Sheet

Organisms found in first grid = __57__ (Grid # _18_)

A minimum of 4 grids must be picked.

Magnifying visors are to be used when sub-sampling.

Grid I.D. #	# of Organisms	Grid I.D. #	# of Organisms	Grid I.D. #	# of Organisms	Grid I.D. #	# of Organisms
1	121						
10	38						
8	10						

Total organisms = __226__   Total grids = __4__

IF after picking, there are >121 organisms, then return picked sample to 15-30 grid tray and remove grids (per SOP) to reduce sample to 121 organisms or less. Record data below.

Total # of organisms retained = __115__
Grids removed to reduce sample to 121 organisms or fewer = __7__
Percentage of grids retained for sample (to total grids) = _____

_____ x _____ = _____
(# of grids from   (% of grids   (final corrected # of grids
original sample {A})   retained)   from original sample)

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

STREAM NAME SFP1	LOCATION under water truck fill
STATION # SFP1 RIVERMILE	STREAM CLASS
LAT LONG	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS N JK	
FORM COMPLETED BY JK	DATE 11/5/12 TIME ___ AM ⊙PM	REASON FOR SURVEY

WEATHER CONDITIONS	Now ☐ ☐ ☐ %☐ ☑	storm (heavy rain) rain (steady rain) showers (intermittent) %cloud cover clear/sunny	Past 24 hours ☐ ☐ ☐ ☐ ___% ☐	Has there been a heavy rain in the last 7 days? ☑Yes ☐No Air Temperature 14 °C Other _____
SITE LOCATION/MAP	Draw a map of the site and indicate the areas sampled (or attach a photograph) at lot in map Pics 104 - 109			pH 7.6 DO 8.3 Cond 2020 Temp 14.0
STREAM CHARACTERIZATION	Stream Subsystem ☑ Perennial ☐ Intermittent ☐ Tidal Stream Origin ☐ Glacial ☑ Spring-fed ☐ Non-glacial montane ☐ Mixture of origins ☐ Swamp and bog ☐ Other____		Stream Type ☐ Coldwater ☐ Warmwater Catchment Area _____ km²	

Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition - Form 1

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PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse ☑ Forest ☐ Commercial ☐ Field/Pasture ☑ Industrial ☐ Agricultural ☐ Other _____ ☐ Residential	Local Watershed NPS Pollution ☐ No evidence ☐ Some potential sources ☑ Obvious sources Local Watershed Erosion ☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present ☐ Trees ☑ Shrubs ☐ Grasses ☐ Herbaceous dominant species present _____	

INSTREAM FEATURES	Estimated Reach Length _100_ m Estimated Stream Width _5_ m Sampling Reach Area _____ m² Area in km² (m²x1000) _____ km² Estimated Stream Depth _____ m Surface Velocity _____ m/sec (at thalweg)	Canopy Cover ☐ Partly open ☑ Partly shaded ☐ Shaded High Water Mark _.25_ m Proportion of Reach Represented by Stream Morphology Types ☐ Riffle _60_ % ☐ Run _30_ % ☐ Pool _10_ % Channelized ☐ Yes ☑ No Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS	LWD _____ m² Density of LWD _____ m²/km² (LWD/ reach area)	

AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present ☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating ☐ Floating Algae ☑ Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation _30_ %	

WATER QUALITY	Temperature _____ °C Specific Conductance _____ Dissolved Oxygen _____ pH _____ Turbidity _____ WQ Instrument Used _____	Water Odors ☐ Normal/None ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other _____ Water Surface Oils ☐ Slick ☐ Sheen ☐ Globs ☐ Flecks ☑ None ☐ Other _____ Turbidity (if not measured) ☑ Clear ☐ Slightly turbid ☐ Turbid ☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE	Odors ☑ Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Anaerobic ☐ None ☐ Other _____ Oils ☑ Absent ☐ Slight ☐ Moderate ☐ Profuse	Deposits ☐ Sludge ☐ Sawdust ☐ Paper fiber ☑ Sand ☐ Relict shells ☑ Other _silt_ Looking at stones which are not deeply embedded, are the undersides black in color? ☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		20	Detritus	sticks, wood, coarse plant materials (CPOM)	15
Boulder	> 256 mm (10")	5			
Cobble	64-256 mm (2.5"-10")	30	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	30			
Sand	0.06-2mm (gritty)	10	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	5			
Clay	< 0.004 mm (slick)				

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION
STATION # 5FP1 RIVERMILE _____	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY	DATE 11/5/12 TIME _____ AM/PM	REASON FOR SURVEY

	Habitat Parameter	Condition Category			
		Optimal	**Suboptimal**	**Marginal**	**Poor**
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE				
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE				
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE				
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE				
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE				

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE				
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE				
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)				
SCORE ___ (RB)				
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)				
SCORE ___ (RB)				
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE ___ (LB)				
SCORE ___ (RB)				

Parameters to be evaluated broader than sampling reach

Total Score _____

Total Hydropsychidae	Total Ephemeroptera	Total Scrapers	Total Chironomidae	Total PT	Abundance	Total Taxa	EPT Taxa
19.00	0.00	0.00	77.00	39.00	117.00	5.00	3.00

% Ephemeroptera	% PT less Hydropsychidae	% Scrapers	% Chironomidae	Two Dominant Taxa #	% Top two dominant taxa	FFG #	HBI (Family)
0.00	17.09	0.00	65.81	96.00	82.05	591.00	5.05

SFP1A

	VASCI Metrics vs. Standard	VASCI Metrics (Truncated)
Number of Taxa	22.73	22.73
Number of EPT Taxa	27.27	27.27
Percent E	0.00	0.00
Percent PT Less Hydropsychidae	48.02	48.02
Percent Scrapers	0.00	0.00
Percent Chironomidae	34.19	34.19
Percent Two Dominant	25.94	25.94
Hilsenhoff Biotic Index	72.78	72.78

Raw VASCI	Final VASCI
28.86	28.86

Benthic Macroinvertebrate Laboratory Bench Sheet

Station ID:	SFPIA	Sample Subsorted by:	WRB	Date Subsorted:	
StationName:		# of Grids subsorted:			
Date Sampled:	11 / 05/ 12 1723	Total # of Subsorted Insects:			
Sampling Method:		Sample Identified by:		Date Identified:	

	TAXON	# of larvae	Total # of Organisms	# to Ref.Coll.
1	Chironomidae	~~HHT HHT HHT HHT HHT HHT II~~ HHT HHT HHT HHT HHT HHT HHT	77	
2	Capnudae	HHT IIII	9	
3	Hydropsychidae Cheumatopsyche	HHT HHT HHT	15	
4	" Ceratopsyche	IIII	4	
5	Simuludae	I	1	
6	Leuctridae Leuctra	HHT HHT I	11	
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
	TOTALS		117	

Sub-sample and Sample Reduction Sheet

Organisms found in first grid = ___37___ (Grid # _27_)

A minimum of 4 grids must be picked.

Magnifying visors are to be used when sub-sampling.

Grid I.D. #	# of Organisms	Grid I.D. #	# of Organisms	Grid I.D. #	# of Organisms	Grid I.D. #	# of Organisms
20	38						
29	70						
12	45						

Total organisms = __190__   Total grids = __4__

IF after picking, there are >121 organisms, then return picked sample to 15-30 grid tray and remove grids (per SOP) to reduce sample to 121 organisms or less. Record data below.

Total # of organisms retained = __117__
Grids removed to reduce sample to 121 organisms or fewer = __5__
Percentage of grids retained for sample (to total grids) = _____

_____ x _____ = _____
(# of grids from   (% of grids   (final corrected # of grids
original sample {A})   retained)   from original sample)

SEPIA

STREAM NAME SF Pond	LOCATION Road Crossing at Pond
STATION # SFP1A RIVERMILE	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS JR JM	
FORM COMPLETED BY JR	DATE 11/5/12 TIME ____ AM (PM)	REASON FOR SURVEY

WEATHER CONDITIONS	Now		Past 24 hours	Has there been a heavy rain in the last 7 days? ☑Yes ☐No
	☐	storm (heavy rain)	☐	Air Temperature ____ °C
	☐	rain (steady rain)	☐	
	☐	showers (intermittent)	☐	Other _____
	%☐	%cloud cover	☐ %	
	☐	clear/sunny	☑	

SITE LOCATION/MAP	Draw a map of the site and indicate the areas sampled (or attach a photograph)
	Pics 110-115 pH 8.2 DO 9.0 Cond 2060 Temp 12.4

STREAM CHARACTERIZATION	Stream Subsystem ☑ Perennial ☐ Intermittent ☐ Tidal	Stream Type ☐ Coldwater ☑ Warmwater
	Stream Origin ☐ Glacial ☐ Spring-fed ☐ Non-glacial montane ☑ Mixture of origins ☐ Swamp and bog ☐ Other _____	Catchment Area _____ km²

Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition - Form 1

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PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(BACK)

WATERSHED FEATURES	**Predominant Surrounding Landuse** ☑ Forest ☐ Commercial ☐ Field/Pasture ☐ Industrial ☐ Agricultural ☐ Other _____ ☑ Residential **Local Watershed NPS Pollution** ☐ No evidence ☑ Some potential sources ☐ Obvious sources **Local Watershed Erosion** ☐ None ☑ Moderate ☐ Heavy
RIPARIAN VEGETATION (18 meter buffer)	**Indicate the dominant type and record the dominant species present** ☐ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous dominant species present _____
INSTREAM FEATURES	Estimated Reach Length __100__ m Estimated Stream Width __6__ m Sampling Reach Area _____ m² Area in km² (m²x1000) _____ km² Estimated Stream Depth _____ m Surface Velocity (at thalweg) _____ m/sec **Canopy Cover** ☐ Partly open ☑ Partly shaded ☐ Shaded High Water Mark _____ m **Proportion of Reach Represented by Stream Morphology Types** ☐ Riffle __6.8__ % ☐ Run __30__ % ☐ Pool __60__ % Channelized ☐ Yes ☑ No Dam Present ☐ Yes ☑ No
LARGE WOODY DEBRIS	LWD _____ m² Density of LWD _____ m²/km² (LWD/ reach area)
AQUATIC VEGETATION	**Indicate the dominant type and record the dominant species present** ☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating ☐ Floating Algae ☐ Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation __50__ %
WATER QUALITY	Temperature _____ °C Specific Conductance _____ Dissolved Oxygen _____ pH _____ Turbidity _____ WQ Instrument Used _____ **Water Odors** ☑ Normal/None ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other _____ **Water Surface Oils** ☐ Slick ☐ Sheen ☐ Globs ☐ Flecks ☑ None ☐ Other _____ **Turbidity (if not measured)** ☑ Clear ☐ Slightly turbid ☐ Turbid ☐ Opaque ☐ Stained ☐ Other _____
SEDIMENT/ SUBSTRATE	**Odors** ☑ Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Anaerobic ☐ None ☐ Other _____ **Oils** ☑ Absent ☐ Slight ☐ Moderate ☐ Profuse **Deposits** ☐ Sludge ☐ Sawdust ☐ Paper fiber ☑ Sand ☐ Relict shells ☑ Other __Silt__ **Looking at stones which are not deeply embedded, are the undersides black in color?** ☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	20
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")	50	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	30			
Sand	0.06-2mm (gritty)	10	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	10			
Clay	< 0.004 mm (slick)				

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION
STATION # *SFP1A* RIVERMILE	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY	DATE *11/5/12* TIME _____ AM (PM) REASON FOR SURVEY

<table>
<tr><td rowspan="2">Habitat Parameter</td><td colspan="4">Condition Category</td></tr>
<tr><td>Optimal</td><td>Suboptimal</td><td>Marginal</td><td>Poor</td></tr>
<tr><td>1. Epifaunal Substrate/ Available Cover</td><td>Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).</td><td>40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).</td><td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td><td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td></tr>
<tr><td>SCORE</td><td></td><td></td><td></td><td></td></tr>
<tr><td>2. Embeddedness</td><td>Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.</td><td>Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.</td><td>Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.</td><td>Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.</td></tr>
<tr><td>SCORE</td><td></td><td></td><td></td><td></td></tr>
<tr><td>3. Velocity/Depth Regime</td><td>All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)</td><td>Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).</td><td>Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).</td><td>Dominated by 1 velocity/depth regime (usually slow-deep).</td></tr>
<tr><td>SCORE</td><td></td><td></td><td></td><td></td></tr>
<tr><td>4. Sediment Deposition</td><td>Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.</td><td>Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.</td><td>Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.</td><td>Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.</td></tr>
<tr><td>SCORE</td><td></td><td></td><td></td><td></td></tr>
<tr><td>5. Channel Flow Status</td><td>Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.</td><td>Water fills >75% of the available channel; or <25% of channel substrate is exposed.</td><td>Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.</td><td>Very little water in channel and mostly present as standing pools.</td></tr>
<tr><td>SCORE</td><td></td><td></td><td></td><td></td></tr>
</table>

Parameters to be evaluated in sampling reach

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Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE				
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE				
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE ___ (LB) SCORE ___ (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
9. Vegetative Protection (score each bank) SCORE ___ (LB) SCORE ___ (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE ___ (LB) SCORE ___ (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.

Parameters to be evaluated broader than sampling reach

Total Score _____

Station
SFP2

Total Hydropsychidae	Total Ephemeroptera	Total Scrapers	Total Chironomidae	Total PT	Abundance	Total Taxa	EPT Taxa
27.00	0.00	0.00	43.00	60.00	104.00	6.00	4.00

% Ephemeroptera	% PT less Hydropsychidae	% Scrapers	% Chironomidae	Two Dominant Taxa #	% Top two dominant taxa	FFG #	HBI (Family)
0.00	0.00	31.73	41.35	66.00	63.46	464.00	4.46

SFP2

VASCI Metrics vs. Standard	VASCI Metrics (Truncated)	
Number of Taxa	27.27	27.27
Number of EPT Taxa	36.36	36.36
Percent E	0.00	0.00
Percent PT Less Hydropsychidae	89.13	89.13
Percent Scrapers	0.00	0.00
Percent Chironomidae	58.65	58.65
Percent Two Dominant	52.80	52.80
Hilsenhoff Biotic Index	81.45	81.45

Raw VASCI	Final VASCI
43.21	43.21

Benthic Macroinvertebrate Laboratory Bench Sheet

Station ID:	SFP-2	Sample Subsorted by:		Date Subsorted:	
StationName:		# of Grids subsorted:			
Date Sampled:	/ /	Total # of Subsorted Insects:			
Sampling Method:		Sample Identified by:		Date Identified:	

🐟	TAXON	# of larvae	Total # of Organisms	# to Ref.Coll.
1	Tipulidae	l	l	
2	Rhyacophilidae Rhyacophila	l	l	
3	Hydropsychidae Ceratopsyche	IIII IIII IIII	14	
4	Cheumatopsyche	IIII IIII III	13	
5	Chironomidae	IIII IIII IIII IIIIIIII IIIIIIIIIIIII	43	
6	Taeneopterigidae Strophopteryx	IIII IIII	9	
7	Capniidae Allocapnia	IIII IIIIIIII IIII III	23	
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
	TOTALS		104	

Sub-sample and Sample Reduction Sheet

Organisms found in first grid = __2.8__ (Grid # _30_)

A minimum of 4 grids must be picked.

Magnifying visors are to be used when sub-sampling.

Grid I.D. #	# of Organisms		Grid I.D. #	# of Organisms		Grid I.D. #	# of Organisms		Grid I.D. #	# of Organisms
22	32									
21	09									
26	35									

Total organisms = __104__   Total grids = __4__

IF after picking, there are >121 organisms, then return picked sample to 15-30 grid tray and remove grids (per SOP) to reduce sample to 121 organisms or less. Record data below.

Total # of organisms retained = __104__

Grids removed to reduce sample to 121 organisms or fewer = _____

Percentage of grids retained for sample (to total grids) = _____

_____ x _____ = _____

(# of grids from original sample {A})   (% of grids retained)   (final corrected # of grids from original sample)

SFP-2

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

STREAM NAME SF Daniel	LOCATION 100 m below conf Rat creek
STATION # SFP 2 RIVERMILE	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS M TM	
FORM COMPLETED BY M	DATE 11/5/12 TIME ___ AM PM	REASON FOR SURVEY

WEATHER CONDITIONS	Now	Past 24 hours	Has there been a heavy rain in the last 7 days?
	☐ storm (heavy rain)	☐	☐ Yes ☐ No
	☐ rain (steady rain)	☐	Air Temperature 5 °C
	☐ showers (intermittent)	☐	
	__%☐ %cloud cover	☐ __%	Other _____
	☐ clear/sunny	☐	

SITE LOCATION/MAP — Draw a map of the site and indicate the areas sampled (or attach a photograph)

at lot on map

Pics
81 - 86
Iphone

pH 8.4
DO 9.0
Cond 1942
Temp 12.4.

STREAM CHARACTERIZATION	Stream Subsystem ☑ Perennial ☐ Intermittent ☐ Tidal	Stream Type ☐ Coldwater ☑ Warmwater
	Stream Origin ☐ Glacial ☐ Non-glacial montane ☐ Swamp and bog ☐ Spring-fed ☑ Mixture of origins ☐ Other _____	Catchment Area _____ km²

Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition - Form 1

A-5

WATERSHED FEATURES	Predominant Surrounding Landuse ☑ Forest ☐ Commercial ☐ Field/Pasture ☐ Industrial ☐ Agricultural ☐ Other _____ ☑ Residential	Local Watershed NPS Pollution ☐ No evidence ☑ Some potential sources ☐ Obvious sources Local Watershed Erosion ☐ None ☑ Moderate ☐ Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present ☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous dominant species present _____	
INSTREAM FEATURES	Estimated Reach Length _100_ m Estimated Stream Width _8_ m Sampling Reach Area _____ m² Area in km² (m²x1000) _____ km² Estimated Stream Depth _____ m Surface Velocity _____ m/sec (at thalweg)	Canopy Cover ☑ Partly open ☐ Partly shaded ☐ Shaded High Water Mark _1.5_ m Proportion of Reach Represented by Stream Morphology Types ☐ Riffle _60_ % ☐ Run _35_ % ☐ Pool _5_ % Channelized ☐ Yes ☑ No LOB Dam Present ☐ Yes ☑ No Road
LARGE WOODY DEBRIS	LWD _____ m² Density of LWD _____ m³/km² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present ☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating ☐ Floating Algae ☐ Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation _45_ %	
WATER QUALITY	Temperature _____ °C Specific Conductance _____ Dissolved Oxygen _____ pH _____ Turbidity _____ WQ Instrument Used _____	Water Odors ☑ Normal/None ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other _____ Water Surface Oils ☐ Slick ☐ Sheen ☐ Globs ☐ Flecks ☑ None ☐ Other _____ Turbidity (if not measured) ☑ Clear ☐ Slightly turbid ☐ Turbid ☐ Opaque ☐ Stained ☐ Other
SEDIMENT/ SUBSTRATE	Odors ☑ Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Anaerobic ☐ None ☐ Other _____ Oils ☑ Absent ☐ Slight ☐ Moderate ☐ Profuse	Deposits ☐ Sludge ☐ Sawdust ☐ Paper fiber ☑ Sand ☐ Relict shells ☑ Other _Silt_ Looking at stones which are not deeply embedded, are the undersides black in color? ☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		5	Detritus	sticks, wood, coarse plant materials (CPOM)	15
Boulder	> 256 mm (10")	10			
Cobble	64-256 mm (2.5"-10")	50	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	30			
Sand	0.06-2mm (gritty)	5	Marl	grey, shell fragments	
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

STREAM NAME	LOCATION
STATION # __SEP 2__ RIVERMILE ____	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY	DATE 11/5/12 REASON FOR SURVEY TIME _____ AM (PM)

	Habitat Parameter	Condition Category			
		Optimal	**Suboptimal**	**Marginal**	**Poor**
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE				
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE				
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE				
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE				
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE				

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE				
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE				
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE ___ (LB) SCORE ___ (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
9. Vegetative Protection (score each bank) SCORE ___ (LB) SCORE ___ (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE ___ (LB) SCORE ___ (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.

Total Score _____

Total Hydropsychidae	Total Ephemeroptera	Total Scrapers	Total Chironomidae	Total PT	Abundance	Total Taxa	EPT Taxa
9.00	12.00	7.00	20.00	51.00	109.00	15.00	8.00

% Ephemeroptera	% PT less Hydropsychidae	% Scrapers	% Chironomidae	Two Dominant Taxa #	% Top two dominant taxa	FFG #	HBI (Family)
11.01	38.53	6.42	18.35	46.00	42.20	378.00	3.47

SC1

	VASCI Metrics vs. Standard	VASCI Metrics (Truncated)
Number of Taxa	68.18	68.18
Number of EPT Taxa	72.73	72.73
Percent E	17.96	17.96
Percent PT Less Hydropsychidae	108.24	100.00
Percent Scrapers	12.45	12.45
Percent Chironomidae	81.65	81.65
Percent Two Dominant	83.52	83.52
Hilsenhoff Biotic Index	96.06	96.06

Raw VASCI	Final VASCI
67.60	66.57

Benthic Macroinvertebrate Laboratory Bench Sheet

Station ID:	SC1	Sample Subsorted by:		Date Subsorted:		
StationName:		# of Grids subsorted:				
Date Sampled:	/ /	Total # of Subsorted Insects:				
Sampling Method:		Sample Identified by:		Date Identified:		

		TAXON	# of larvae	Total # of Organisms	# to Ref.Coll.
1		Tipulidae	ЖIII	8	
2		Chironomidae	ЖЖ ЖЖ ЖЖ ЖЖ	20	
3		Elmidae	III	3	
4		Simuliidae	ЖI	6	
5		Psephenidae	I	1	
6		Philopotamidae Chimarra	ЖI	6	
7		Heptageniidae Maccaffertium	III	3	
8		Baetidae Acentrella/Baetis	ЖII	7	
9		Hydropsychidae Cheumatopsyche	IIII	4	
10		" Ceratopsyche	Ж	5	
11		Leuctridae Leuctra	ЖЖ ЖЖ ЖЖ ЖЖ ЖЖ I	26	
12		Capniidae Allocapnia	ЖIII	8	
13		Ephemerellidae Drunella	II	2	
14		Nemouridae Nemoura	II	2	
15		Collembola	ЖII	7	
16		Asellidae	I	1	
17					
18					
19					
20					
21					
22					
23					
24					
25					
		TOTALS		109	

Sub-sample and Sample Reduction Sheet

Organisms found in first grid = ___40___ (Grid #_7_)

A minimum of 4 grids must be picked.

Magnifying visors are to be used when sub-sampling.

Grid I.D. #	# of Organisms		Grid I.D. #	# of Organisms		Grid I.D. #	# of Organisms		Grid I.D. #	# of Organisms
19	05									
1	17									
4	29									
9	18									

Total organisms = ___109___   Total grids = ___5___

IF after picking, there are >121 organisms, then return picked sample to 15-30 grid tray and remove grids (per SOP) to reduce sample to 121 organisms or less. Record data below.

Total # of organisms retained = ___109___
Grids removed to reduce sample to 121 organisms or fewer = _____
Percentage of grids retained for sample (to total grids) = _____

_____ x _____ = _____
(# of grids from   (% of grids   (final corrected # of grids
original sample {A})   retained)   from original sample)

STREAM NAME Short Creek	LOCATION 156 m US Conf Red Cr
STATION # 5C1 RIVERMILE	STREAM CLASS
LAT LONG	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS M JM	
FORM COMPLETED BY M	DATE 4/5/12 TIME ___ AM (PM)	REASON FOR SURVEY

WEATHER CONDITIONS	Now		Past 24 hours	Has there been a heavy rain in the last 7 days? ☑Yes ☐No
	☐	storm (heavy rain)	☐	Air Temperature 15 °C
	☐	rain (steady rain)	☐	
	☐	showers (intermittent)	☐	Other _____
	%☐	%cloud cover	☐ %	
	☐	clear/sunny	☐	

SITE LOCATION/MAP — Draw a map of the site and indicate the areas sampled (or attach a photograph)

at loc, on map

+ 1 Crayfish

Pics
87-92
Iphone

PH 8.1
DO 9.2
Cond 401
Temp 9.2

STREAM CHARACTERIZATION	Stream Subsystem ☑Perennial ☐Intermittent ☐Tidal	Stream Type ☐Coldwater ☑Warmwater
	Stream Origin ☐Glacial ☐Non-glacial montane ☐Swamp and bog ☐Spring-fed ☑Mixture of origins ☐Other ___	Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(BACK)

WATERSHED FEATURES	**Predominant Surrounding Landuse** ☑ Forest ☐ Commercial ☐ Field/Pasture ☐ Industrial ☐ Agricultural ☐ Other _____ ☑ Residential **Local Watershed NPS Pollution** ☐ No evidence ☑ Some potential sources ☐ Obvious sources **Local Watershed Erosion** ☐ None ☑ Moderate ☐ Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present ☑ Trees ☑ Shrubs ☐ Grasses ☐ Herbaceous dominant species present _____
INSTREAM FEATURES	Estimated Reach Length _100_ m Estimated Stream Width _2.5_ m Sampling Reach Area _____ m² Area in km² (m²x1000) _____ km² Estimated Stream Depth _____ m Surface Velocity (at thalweg) _____ m/sec	**Canopy Cover** ☑ Partly open ☐ Partly shaded ☐ Shaded High Water Mark _____ m **Proportion of Reach Represented by Stream Morphology Types** ☐ Riffle _80_ % ☐ Run _20_ % ☐ Pool _20_ % Channelized ☐ Yes ☑ No LDB Dam Present ☐ Yes ☑ No Road
LARGE WOODY DEBRIS	LWD _____ m³ Density of LWD _____ m²/km² (LWD/ reach area)
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present ☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating ☐ Floating Algae ☑ Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation _45_ %
WATER QUALITY	Temperature _____ °C Specific Conductance _____ Dissolved Oxygen _____ pH _____ Turbidity _____ WQ Instrument Used _____	**Water Odors** ☑ Normal/None ☐ Sewage ☑ Petroleum ☐ Chemical ☐ Fishy ☐ Other _____ **Water Surface Oils** ☐ Slick ☐ Sheen ☐ Globs ☐ Flecks ☑ None ☐ Other _____ **Turbidity (if not measured)** ☑ Clear ☐ Slightly turbid ☐ Turbid ☐ Opaque ☐ Stained ☐ Other _____
SEDIMENT/ SUBSTRATE	**Odors** ☑ Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Anaerobic ☐ None ☐ Other _____ **Oils** ☑ Absent ☐ Slight ☐ Moderate ☐ Profuse	**Deposits** ☐ Sludge ☐ Sawdust ☐ Paper fiber ☑ Sand ☐ Relict shells ☑ Other _Silt_ Looking at stones which are not deeply embedded, are the undersides black in color? ☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	30
Boulder	> 256 mm (10")	5			
Cobble	64-256 mm (2.5"-10")	40	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	40			
Sand	0.06-2mm (gritty)	10	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	5			
Clay	< 0.004 mm (slick)				

STREAM NAME	LOCATION
STATION # SC 1 RIVERMILE_____	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY	DATE 11/5/12 REASON FOR SURVEY TIME _____ AM (PM)

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE				
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE				
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE				
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE				
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE				

Parameters to be evaluated broader then sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE				
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE				
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB) SCORE ___ (RB)				
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB) SCORE ___ (RB)				
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE ___ (LB) SCORE ___ (RB)				

Total Score _____

Station					
RC1					

Total Hydropsychidae	Total Ephemeroptera	Total Scrapers	Total Chironomidae	Total PT	Abundance	Total Taxa	EPT Taxa
13.00	2.00	0.00	54.00	41.00	102.00	11.00	6.00

% Ephemeroptera	% PT less Hydropsychidae	% Scrapers	% Chironomidae	Two Dominant Taxa #	% Top two dominant taxa	FFG #	HBI (Family)
1.96	27.45	0.00	52.94	74.00	72.55	462.00	4.53

RC1

	VASCI Metrics vs. Standard	VASCI Metrics (Truncated)
Number of Taxa	50.00	50.00
Number of EPT Taxa	54.55	54.55
Percent E	3.20	3.20
Percent PT Less Hydropsychidae	77.11	77.11
Percent Scrapers	0.00	0.00
Percent Chironomidae	47.06	47.06
Percent Two Dominant	39.67	39.67
Hilsenhoff Biotic Index	80.45	80.45

Raw VASCI	Final VASCI
44.00	44.00

Benthic Macroinvertebrate Laboratory Bench Sheet

Station ID:	RC 1	Sample Subsorted by:		Date Subsorted:	
Station Name:		# of Grids subsorted:			
Date Sampled:	/ /	Total # of Subsorted Insects:			
Sampling Method:		Sample Identified by:		Date Identified:	

	TAXON	# of larvae	Total # of Organisms	# to Ref.Coll.
1	Tipulidae	II	2	
2	Chironomidae	IIII IIII / LIII LIII IIII LIII IIII LIII IIII LIII IIII	54	
3	Empididae	I	1	
4	Philopotamidae Chimarra	III	3	
5	Hydropsychidae Cheumatopsyche	LIII LIII III	13	
6	Capniidae Allocapnia	LIII IIII LIII IIII	20	
7	Gomphidae	I	1	
8	Simuliidae	I	1	
9	Leuctridae Leuctra	III	3	
10	Baetidae Acentrella/Baetis	II	2	
11	Nemouridae Nemoura	II	2	
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
	TOTALS		102	

Sub-sample and Sample Reduction Sheet

Organisms found in first grid = ___13___   (Grid # _5_)

A minimum of 4 grids must be picked.

Magnifying visors are to be used when sub-sampling.

Grid I.D. #	# of Organisms	Grid I.D. #	# of Organisms	Grid I.D. #	# of Organisms	Grid I.D. #	# of Organisms
15	16						
1	11						
9	10						
28	16						
12	6						
6	7						
18	23						

Total organisms = __102__   Total grids = __8__

IF after picking, there are >121 organisms, then return picked sample to 15-30 grid tray and remove grids (per SOP) to reduce sample to 121 organisms or less. Record data below.

Total # of organisms retained = __102__
Grids removed to reduce sample to 121 organisms or fewer = _____
Percentage of grids retained for sample (to total grids) = _____

_____ x _____ = _____
(# of grids from   (% of grids   (final corrected # of grids
original sample {A})   retained)   from original sample)

RC 4

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

STREAM NAME Rat Creek	LOCATION 150 m US Conf Short Creek
STATION # RC1 RIVERMILE	STREAM CLASS
LAT LONG	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS M IM	
FORM COMPLETED BY JR	DATE 11/5/12 TIME ____ AM/PM	REASON FOR SURVEY

WEATHER CONDITIONS

Now
- ☐ storm (heavy rain)
- ☐ rain (steady rain)
- ☐ showers (intermittent)
- %☐ %cloud cover
- ☑ clear/sunny

Past 24 hours
- ☐
- ☐
- ☐
- ☐ / %

Has there been a heavy rain in the last 7 days?
☐ Yes   ☐ No

Air Temperature 14 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)

at Cor. on map

Pics
93-98
Iphone

pH 8,0
DO 9.2
Cond 1224
Temp 9.4

STREAM CHARACTERIZATION

Stream Subsystem
- ☐ Perennial   ☐ Intermittent   ☐ Tidal

Stream Origin
- ☐ Glacial
- ☐ Non-glacial montane
- ☐ Swamp and bog
- ☐ Spring-fed
- ☑ Mixture of origins
- ☐ Other _____

Stream Type
- ☐ Coldwater   ☐ Warmwater

Catchment Area _____ km²

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A-5

WATERSHED FEATURES	Predominant Surrounding Landuse ☑ Forest ☐ Commercial ☐ Field/Pasture ☐ Industrial ☐ Agricultural ☐ Other _____ ☐ Residential	Local Watershed NPS Pollution ☐ No evidence ☑ Some potential sources ☐ Obvious sources Local Watershed Erosion ☐ None ☑ Moderate ☐ Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present ☐ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous dominant species present _____	
INSTREAM FEATURES	Estimated Reach Length _100_ m Estimated Stream Width _2.5_ m Sampling Reach Area _____ m² Area in km² (m²x1000) _____ km² Estimated Stream Depth _____ m Surface Velocity (at thalweg) _____ m/sec	Canopy Cover ☐ Partly open ☑ Partly shaded ☐ Shaded High Water Mark _____ m Proportion of Reach Represented by Stream Morphology Types ☐ Riffle _50_ % ☐ Run _30_ % ☐ Pool _20_ % Channelized ☐ Yes ☑ No Dam Present ☐ Yes ☑ No _RDB Road_
LARGE WOODY DEBRIS	LWD _____ m² Density of LWD _____ m³/km² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present ☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating ☐ Floating Algae ☑ Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation _30_ %	
WATER QUALITY	Temperature _____ °C Specific Conductance _____ Dissolved Oxygen _____ pH _____ Turbidity _____ WQ Instrument Used _____	Water Odors ☑ Normal/None ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other _____ Water Surface Oils ☐ Slick ☐ Sheen ☐ Globs ☐ Flecks ☑ None ☐ Other _____ Turbidity (if not measured) ☐ Clear ☐ Slightly turbid ☐ Turbid ☐ Opaque ☐ Stained ☐ Other _____
SEDIMENT/ SUBSTRATE	Odors ☑ Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Anaerobic ☐ None ☐ Other _____ Oils ☑ Absent ☐ Slight ☐ Moderate ☐ Profuse	Deposits ☐ Sludge ☐ Sawdust ☐ Paper fiber ☑ Sand ☐ Relict shells ☑ Other _Silt_ Looking at stones which are not deeply embedded, are the undersides black in color? ☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	35
Boulder	> 256 mm (10")	10			
Cobble	64-256 mm (2.5"-10")	40	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	30			
Sand	0.06-2mm (gritty)	10	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	10			
Clay	< 0.004 mm (slick)				

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME		LOCATION	
STATION # RC1 RIVERMILE		STREAM CLASS	
LAT LONG		RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS			
FORM COMPLETED BY		DATE 4/5/12 TIME ___ AM (PM)	REASON FOR SURVEY

	Habitat Parameter	Condition Category			
		Optimal	**Suboptimal**	**Marginal**	**Poor**
Parameters to be evaluated in sampling reach	**1. Epifaunal Substrate/ Available Cover**	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE				
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE				
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE				
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE				
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE				

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RDB
Road

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE				
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE				
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)				
SCORE ___ (RB)				
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)				
SCORE ___ (RB)				
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)				
SCORE ___ (RB)				

Parameters to be evaluated broader than sampling reach

Total Score _____

Appendix A-1: Habitat Assessment and Physicochemical Characterization Field Data Sheets - Form 2

Station
GF1

Total Hydropsychidae	Total Ephemeroptera	Total Scrapers	Total Chironomidae	Total PT	Abundance	Total Taxa	EPT Taxa
12.00	0.00	1.00	15.00	88.00	111.00	12.00	6.00

% Ephemeroptera	% PT less Hydropsychidae	% Scrapers	% Chironomidae	Two Dominant Taxa #	% Top two dominant taxa	FFG #	HBI (Family)
0.00	68.47	0.90	13.51	64.00	57.66	316.00	2.85

GF1

	VASCI Metrics vs. Standard	VASCI Metrics (Truncated)
Number of Taxa	54.55	54.55
Number of EPT Taxa	54.55	54.55
Percent E	0.00	0.00
Percent PT Less Hydropsychidae	192.33	100.00
Percent Scrapers	1.75	1.75
Percent Chironomidae	86.49	86.49
Percent Two Dominant	61.19	61.19
Hilsenhoff Biotic Index	105.19	100.00

Raw VASCI	Final VASCI
69.50	57.31

Benthic Macroinvertebrate Laboratory Bench Sheet

Station ID:	GF1	Sample Subsorted by:		Date Subsorted:	
StationName:		# of Grids subsorted:			
Date Sampled:	/ /	Total # of Subsorted Insects:			
Sampling Method:		Sample Identified by:		Date Identified:	

		TAXON	# of larvae	Total # of Organisms	# to Ref.Coll.
1		Chironomidae	IHT IHT IHT	15	
2		Simulidae	IIII	4	
3		Tipulidae	I	1	
4		Corydalidae	I	1	
5		Hydropsychidae Ceratopsyue	IHT II	7	
6		" Cheumatopsyche	IHT	5	
7		Elmidae	I	1	
8		Capniidae Allocapnia	IHT IHT IHT IHT IHT IHT I	31	
9		Rhyacophilidae Rhyacophila	IHT I	6	
10		Taeniopterygidae Strophopteryx	IHT IHT IHT IHT IHT IHT III	33	
11		Nemouridae Amphinemura	IHT	5	
12		Philopotamidae Wormaldia	I	1	
13		Oligochaeta	I	1	
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
		TOTALS		III	

Sub-sample and Sample Reduction Sheet

Organisms found in first grid = __41__   (Grid # __24__)

A minimum of 4 grids must be picked.

Magnifying visors are to be used when sub-sampling.

Grid I.D. #	# of Organisms	Grid I.D. #	# of Organisms	Grid I.D. #	# of Organisms	Grid I.D. #	# of Organisms
26	65						
10	42						
13	10						

Total organisms = __158__   Total grids = __4__

IF after picking, there are >121 organisms, then return picked sample to 15-30 grid tray and remove grids (per SOP) to reduce sample to 121 organisms or less. Record data below.

Total # of organisms retained = __111__
Grids removed to reduce sample to 121 organisms or fewer = __4__
Percentage of grids retained for sample (to total grids) = _____

_____ x _____ = _____
(# of grids from   (% of grids   (final corrected # of grids
original sample {A})   retained)   from original sample)

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

STREAM NAME _Elarly FK_	LOCATION
STATION # _GF 1_ RIVERMILE_____	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS _rc JM_	
FORM COMPLETED BY _rc_	DATE _11/3/12_ TIME ____ AM (PM)	REASON FOR SURVEY

WEATHER CONDITIONS	**Now** **Past 24 hours** Has there been a heavy rain in the last 7 days? ☐ Yes ☐ No ☐ ☐ storm (heavy rain) ☐ ☐ rain (steady rain) Air Temperature _16_ °C ☐ ☐ showers (intermittent) _%_ ☐ %cloud cover ☐ ___% Other _____ ☐ ☐ clear/sunny
SITE LOCATION/MAP	Draw a map of the site and indicate the areas sampled (or attach a photograph) at box. on map +2 Crayfish Pics pH 7.9 75-80 DO 9.3 Iphone Cond 512 width 14' d1 v1 d2 v2 d3 v3 Temp 7.7 .5'
STREAM CHARACTERIZATION	**Stream Subsystem** ☐ Perennial ☐ Intermittent ☐ Tidal **Stream Type** ☐ Coldwater ☐ Warmwater **Stream Origin** ☐ Glacial ☐ Spring-fed Catchment Area_____ km² ☐ Non-glacial montane ☐ Mixture of origins ☐ Swamp and bog ☐ Other _____

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(BACK)

WATERSHED FEATURES	**Predominant Surrounding Landuse** ☑ Forest ☐ Commercial ☐ Field/Pasture ☐ Industrial ☐ Agricultural ☐ Other _____ ☑ Residential	**Local Watershed NPS Pollution** ☐ No evidence ☑ Some potential sources ☐ Obvious sources **Local Watershed Erosion** ☐ None ☑ Moderate ☐ Heavy
RIPARIAN VEGETATION (18 meter buffer)	**Indicate the dominant type and record the dominant species present** ☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous dominant species present _____	
INSTREAM FEATURES	Estimated Reach Length _100_ m Estimated Stream Width _5_ m Sampling Reach Area _____ m² Area in km² (m²x1000) _____ km² Estimated Stream Depth _____ m Surface Velocity _____ m/sec (at thalweg)	**Canopy Cover** ☐ Partly open ☑ Partly shaded ☐ Shaded High Water Mark _ 2_ m **Proportion of Reach Represented by Stream Morphology Types** ☐ Riffle _60_ % ☐ Run _20_ % ☐ Pool _10_ % Channelized ☐ Yes ☑ No 2013 Dam Present ☐ Yes ☑ No Road
LARGE WOODY DEBRIS	LWD _____ m² Density of LWD _____ m²/km² (LWD/ reach area)	
AQUATIC VEGETATION	**Indicate the dominant type and record the dominant species present** ☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating ☐ Floating Algae ☑ Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation _60_ %	
WATER QUALITY	Temperature _____ °C Specific Conductance _____ Dissolved Oxygen _____ pH _____ Turbidity _____ WQ Instrument Used _____	**Water Odors** ☐ Normal/None ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other _____ **Water Surface Oils** ☐ Slick ☐ Sheen ☐ Globs ☐ Flecks ☑ None ☐ Other _____ **Turbidity (if not measured)** ☑ Clear ☐ Slightly turbid ☐ Turbid ☐ Opaque ☐ Stained ☐ Other _____
SEDIMENT/ SUBSTRATE	**Odors** ☑ Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Anaerobic ☐ None ☐ Other _____ **Oils** ☑ Absent ☐ Slight ☐ Moderate ☐ Profuse	**Deposits** ☐ Sludge ☐ Sawdust ☐ Paper fiber ☑ Sand ☐ Relict shells ☑ Other _Salt_ **Looking at stones which are not deeply embedded, are the undersides black in color?** ☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		5	Detritus	sticks, wood, coarse plant materials (CPOM)	25
Boulder	> 256 mm (10")	5			
Cobble	64-256 mm (2.5"-10")	60	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	20			
Sand	0.06-2mm (gritty)	10	Marl	grey, shell fragments	
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

STREAM NAME		LOCATION	
STATION # __GF1__ RIVERMILE _____		STREAM CLASS	
LAT _____ LONG _____		RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS			
FORM COMPLETED BY		DATE __11/5/12__ TIME _____ AM/PM	REASON FOR SURVEY

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE				
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE				
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE				
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE				
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE				

RDB
Road

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE				
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE				
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)				
SCORE ___ (RB)				
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)				
SCORE ___ (RB)				
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)				
SCORE ___ (RB)				

Parameters to be evaluated broader than sampling reach

Total Score _____